ST GENERAL SCAN TOOL

GENERAL INFORMATION FOR ON BOARD DIAGNOSTIC (OBD)

Characteristics of On Board Diagnostic (OBD)

The Engine Control Module (Motronic Engine Control Module (ECM) -J220-) is equipped with DTC memory.

If malfunctions occur at the exhaust relevant systems or components, they are stored in DTC memory with a description of the malfunction type.

The Engine Control Module (ECM) differentiates between different DTCs after evaluating the information, see **DIAGNOSTIC TROUBLE CODE (DTC) TABLES:**

The stored malfunctions can be checked with a standard diagnostic tester, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

When harness connectors are disconnected from the Engine Control Module (ECM) or the battery is disconnected, all adaptation values in the control module are erased. DTC memory content will remain intact however. If the engine is started after this, rough, uneven idle can result. In this case, the readiness code must be generated again, see **READINESS CODE, GENERATING** .

The following work steps must be performed in the described sequence after the malfunction(s) have been repaired:

1. - Check DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
2. - Erase DTC memory, see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
3. - For completion, generate readiness code, see **READINESS CODE, GENERATING** .

On Board Diagnostic (OBD), technical data

Control module identification

The control module version is displayed by selecting "Diagnostic mode 9: Vehicle information" under address word 33, see **DIAGNOSTIC MODE 9: VEHICLE INFORMATION** .

Engine Control Module (ECM) equipment

ENGINE CONTROL MODULE (ECM) EQUIPMENT DESCRIPTION

Engine code	APH	AWP	AWV
System identification	Motronic ME7.5	Motronic ME7.5	Motronic ME7.5

Terminals at Engine Control Module (ECM)	121	121	121
Emissions limiting values according to	TLEV(1)	LEV(2)	LEV(2)
On Board Diagnostic (OBD)	OBD II	OBD	II OBD II
DTC memory	Permanent memory (3)	Permanent memory (3)	Permanent memory (3)
Memory for adaptation values	Temporary memory (4)	Temporary memory (4)	Temporary memory (4)
Oxygen sensor control	2 sensors	2 sensors	2 sensors
Knock sensor control	2 knock sensors	2 knock sensors	2 knock sensors
Intake manifold change-over	No	No	No
Camshaft adjustment	No	Yes	Yes
Boost pressure regulation	Yes	Yes	Yes
Secondary Air Injection (AIR) system	Yes	Yes	Yes
Electronic engine performance regulation	Yes	Yes	Yes

(1) TLEV = Transient Low Emission Vehicles (emission values max. 0.125 g/mi HC)

(2) LEV = Low Emission Vehicles (emission values max. 0.075 g/mi HC)

(3) Independent of voltage supply.

(4) Values are erased when voltage supply is interrupted.

Selectable diagnostic modes under address word 33 - OBD

NOTE: The conditions required for selecting the desired diagnostic mode are listed in the SELECTABLE DIAGNOSTIC MODES UNDER ADDRESS WORD 33 - OBD table.

SELECTABLE DIAGNOSTIC MODES UNDER ADDRESS WORD 33 - OBD

Diagnostic mode			**Requirement:**		
Selectable diagnostic modes under address word 33 - OBD			• engine off • Ignition switched on.	• Engine running at idle	• Vehicle in drive mode
Mode 1:	Check measured values	See **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES**	Yes	Yes	Yes
Mode 2:	Checking operating conditions	See **DIAGNOSTIC MODE 2: CHECKING OPERATING CONDITIONS**	Yes	Yes	Yes

Mode 3:	Check DTC Memory	See **DIAGNOSTIC MODE 3: CHECK DTC MEMORY**	Yes[1)]	Yes	Yes
Mode 4:	Reset/erase diagnostic data	See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA**	Yes	Yes	Yes
Mode 5:	Check output of oxygen sensor signals	See **DIAGNOSTIC MODE 5: CHECK OUTPUT OF OXYGEN SENSOR SIGNALS**	Yes	Yes	Yes
Mode 6:	Check test results of components that are not continuously monitored	See **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**	No	Yes	Yes
Mode 7:	Check test results of components that are continuously monitored	See **DIAGNOSTIC MODE 7: CHECK TEST RESULTS OF COMPONENTS THAT ARE CONTINUOUSLY MONITORED**	Yes[(1)]	Yes	Yes
Mode 8:	Tank leak test	See **DIAGNOSTIC MODE 8: TANK LEAK TEST**	No	Yes	No
Mode 9:	Vehicle information	See **DIAGNOSTIC MODE 9: VEHICLE INFORMATION**	Yes	Yes	Yes

(1) Perform only with ignition switched on when engine does not start (operate starter beforehand for at least 6 seconds).

Connect diagnostic tester

Recommended special tools and equipment.:

- VAS 5052 Vehicle Diagnostic and Information System with
- VAS 5052/3 diagnostic cable

Requirements

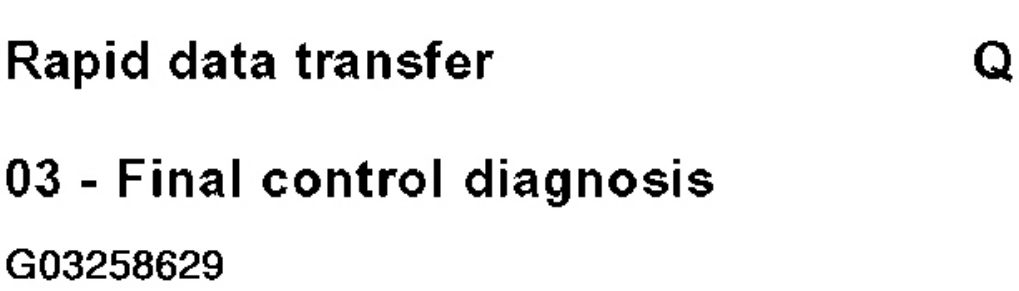

Fig. 1: Identifying VAS 5052 Vehicle Diagnostic And Information System
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- The respective fuses of the Motronic fuel injection and ignition system must be OK. Fuse holder is located behind access panel at far left end of dash.

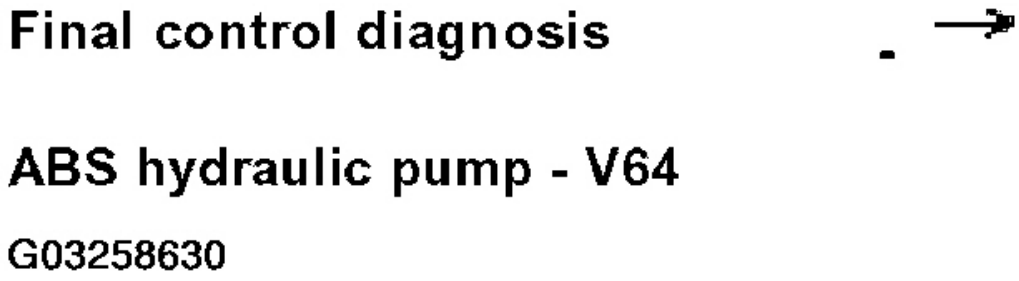

Fig. 2: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- Parking brake must be engaged or else daylight driving lights will be switched on.
- For vehicles with automatic transmission, selector lever must be in position -P- or -N-.
- If vehicle is equipped with an A/C system, it must be switched off.
- Ground (GND) connections between engine and chassis must be OK.
- Ignition switched off.

Work procedure

Connect diagnostic tester (VAS 5052) using (VAS 5052/3) diagnostic cable as follows:

- Connect diagnostic cable connector to Data Link Connector (DLC) -arrow-.

Fig. 3: Identifying Data Link Connector (DLC)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Depending on the desired diagnostic mode, it is necessary to:switch on ignition

or start engine, see **SELECTABLE DIAGNOSTIC MODES UNDER ADDRESS WORD 33 - OBD** .

NOTE:

- **Respective operation of the diagnostic tester:**

  See Operating instructions of the diagnostic tester

- **If no display appears on diagnostic tester, check voltage supply at Diagnostic Link Connector (DLC).**

Connect test box for wiring test

Recommended special tools and equipment

- VAG1598/31 test box

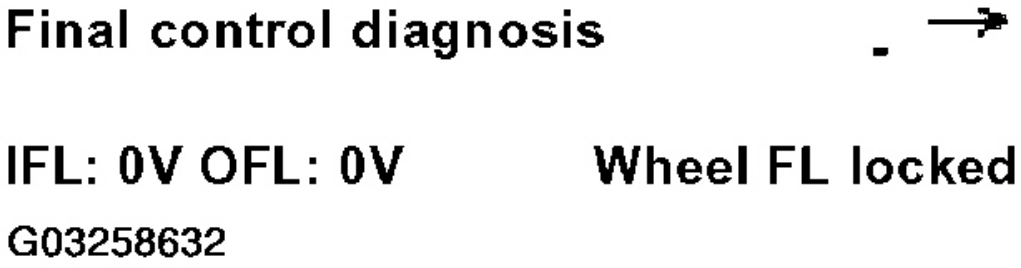

Fig. 4: Identifying VAG1598/31 Test Box
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Requirement

- Ignition switched off.

Work procedure

- Remove inner cover, left plenum chamber, to do this, slide center cover -1- of plenum chamber forward out of catch and remove from instrument panel.

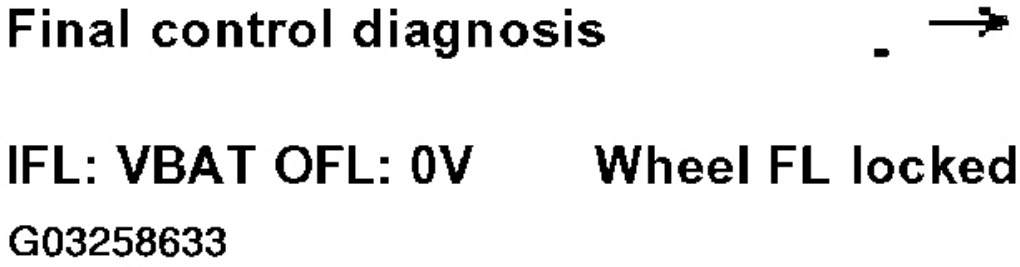

Fig. 5: Removing Inner Cover
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove three bolts -1-.

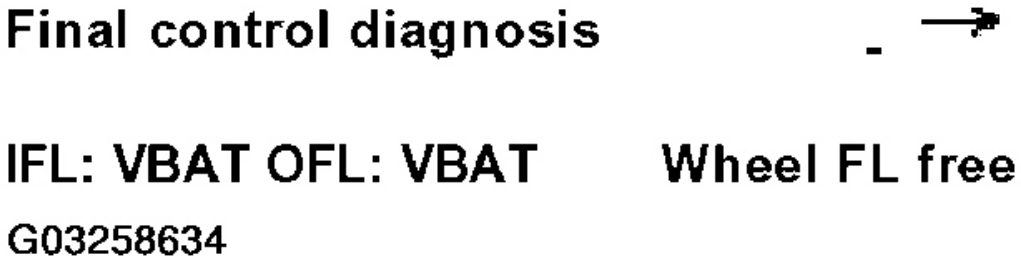

Fig. 6: [Removing Three Bolts]
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Lift left cover -1- of plenum chamber in center of instrument panel (arrow A) and thereby unclip (front edge clips, rear edge clamps).
- Pull cover -1- toward vehicle center out of bracket underneath Apillar (arrow B).
- Then disengage connector from control module and disconnect.

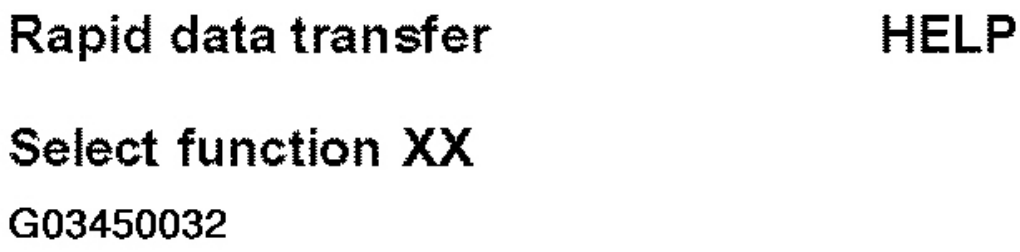

Fig. 7: Pulling Cover Toward Vehicle Center Out Of Bracket Underneath A Pillar
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Connect VAG1598/31 test box at control module wiring harness. Engine Control Module (ECM) is not connected.

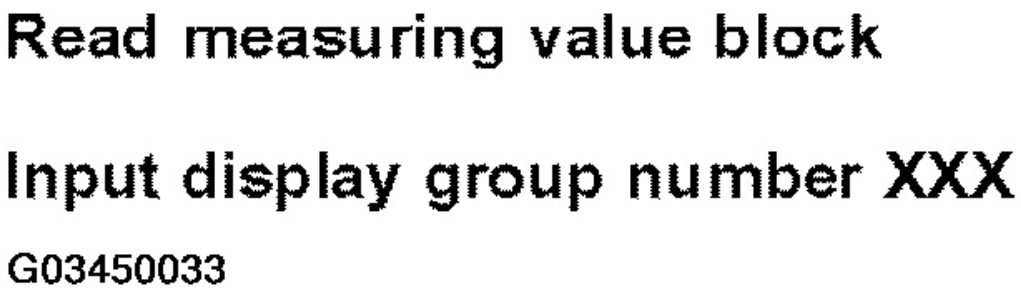

Fig. 8: Connecting VAG1598/31 Test Box At Control Module Wiring Harness
Courtesy of VOLKSWAGEN OF AMERICA, INC.

When harness connectors are disconnected from the Engine Control Module (ECM) or the battery is disconnected, all adaptation values in the control module are erased. DTC memory content will remain intact however. If the engine is started after this, rough, uneven idle can result. In this case, the readiness code must be generated again, see **READINESS CODE, GENERATING** .

Check Malfunction Indicator Lamp (MIL) in instrument cluster

Meaning of exhaust MIL

The Malfunction Indicator Lamp (MIL) lights up when exhaust relevant malfunctions are recognized by the Engine Control Module (ECM).

Component location of exhaust MIL

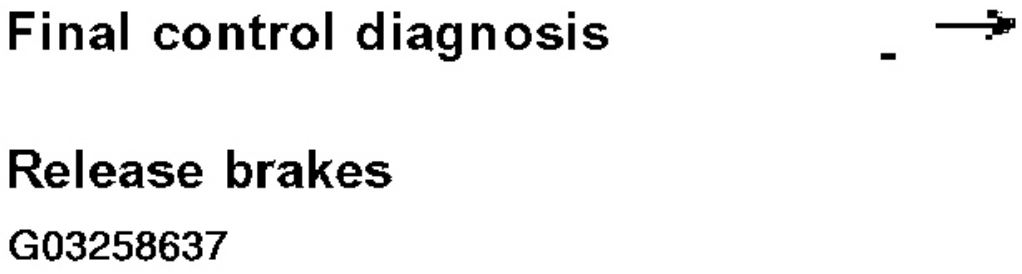

Fig. 9: Identifying ECM Harness Connector Terminals

Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE: The Malfunction Indicator Lamp (MIL) can blink or remain lit continuously. DTC memory must be checked in each case, see DIAGNOSTIC MODE 3: CHECK DTC MEMORY .

- Blinking: There is a malfunction that causes damage to the catalytic converter in this driving condition. In this case, vehicle must only be driven at reduced performance!
- Continuously lit: There is a malfunction that causes increased emissions. Check DTC memory for Motronic control module.
- DTC memory must still be checked if there are drivability problems or customer complaints and the MIL is not lit, since malfunctions can be stored without causing the MIL to light immediately.

Recommended special tools and equipment

- VAG1526 multimeter or VAG1715 multimeter
- VAG1594 connector test kit
- Wiring diagram

Test requirement

- The respective fuses of Malfunction Indicator Lamp (MIL) -K83- must be OK. Fuse holder is located behind access panel at far left end of dash.

Fig. 10: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Test sequence

- Switch on ignition:

exhaust MIL must light up.

If exhaust MIL does not light up when ignition is switched on:

- Switch ignition off.
- Check wire from ECM to exhaust MIL as follows:
- Connect test box to control module wiring harness, see **CONNECT TEST BOX FOR WIRING TEST** .
- Bridge sockets 2+47 of test box with the respective adapter cables.
- Switch on ignition:

exhaust MIL must light up.

If Malfunction Indicator Lamp (MIL) does not light up:

- Switch ignition off.
- Remove instrument cluster:

  See **INSTRUMENT CLUSTER, REMOVING AND INSTALLING**

- Check wire connection from Engine Control Module (ECM) to Malfunction Indicator Lamp (MIL) -K83- according to wiring diagram.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

  If no malfunctions are detected in wire from Engine Control Module (ECM) to Malfunction Indicator Lamp (MIL):

- Replace Motronic Engine Control Module (ECM) -J220-, see **REPLACING ENGINE CONTROL MODULE (ECM)** .

If exhaust MIL lights up when ignition is switched on:

- Start engine and let run at idle:

  Exhaust MIL must

  go out after a few seconds.

  If Malfunction Indicator Lamp (MIL) does not go out:

- Switch ignition off.
- Remove instrument cluster:

See **INSTRUMENT CLUSTER, REMOVING AND INSTALLING**

- Connect test box to control module wiring harness, see **CONNECT TEST BOX FOR WIRING TEST** .
- Check wire connection between test box socket 47 and instrument cluster for short circuit to Ground (GND) according to wiring diagram.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

If no malfunctions are detected in wire from Engine Control Module (ECM) to Malfunction Indicator Lamp (MIL):

- Replace Motronic Engine Control Module (ECM) -J220-, see **REPLACING ENGINE CONTROL MODULE (ECM)** .

SELECT DIAGNOSTIC MODE

Recommended special tools and equipment:

- VAS 5052 Vehicle Diagnostic and Information System with
- VAS 5052/3 diagnostic cable

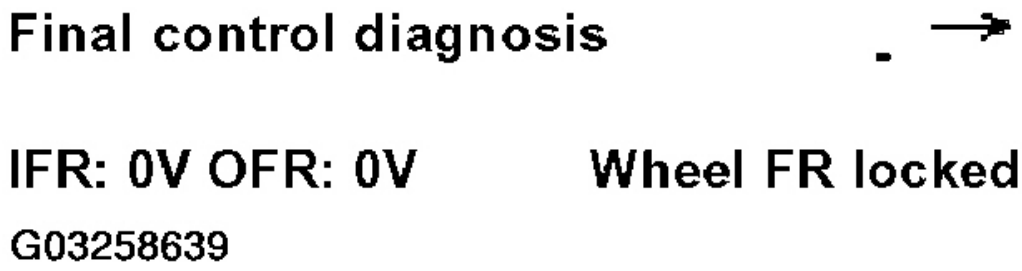

Fig. 11: Identifying VAS 5052 Vehicle Diagnostic And Information System
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Address word 33 - On-Board Diagnostic (OBD)

Function

Via the diagnostic tester, different diagnostic modes can be selected under "address word 33 - On-Board Diagnostic (OBD)".

The following diagnostic modes monitor all components and systems which influence the emission quality.

Diagnostic mode 1: Check measured values

Requirement

- Coolant temperature must be at least 80 °C, see PID 5, Coolant temperature.

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Depending on the desired operating condition:switch on ignition

  or start engine and let run at idle.

- Under address word 33, select "Diagnostic mode 1: Checking measured values."
- Select the desired measured values "PID XX".

NOTE:

- **The specified values for the respective measuring values can be found at the respective component- and function tests.**
- **The following list only serves as an overview.**
- **The measuring values are sorted according to the PID (parameter - identifications).**

DIAGNOSTIC MODE 1: CHECK MEASURED VALUES

PID	Display measuring values
01:	Monitoring status since erasing DTC memory
03:	Condition of the fuel system
04:	Calculated load condition value
05:	Coolant temperature
06:	Short time gasoline -air ratio bank 1
07:	Gasoline-air ratio bank 1
12:	Engine rotations per minute (RPM)
13:	Vehicle speed
14:	Valve timing adjustment at 1. cyl. to "advance"
15:	Intake Air Temperature (IAT)
16:	Air flow quantity at Mass Air Flow (MAF) sensor
17:	Throttle valve position (absolute)

DIAGNOSTIC MODE 1: CHECK MEASURED VALUES

PID	Display measuring values
18:	Availability status of secondary air
19:	Component location of oxygen sensors

21:	Bank 1 - sensor 2
28:	OBD requirement for which this vehicle is equipped
52:	Sensor current bank 1 sensor 1

- End diagnosis and switch ignition off.

Diagnostic mode 2: Checking operating conditions

Function

This diagnostic mode displays the operating conditions at which an emission relevant malfunction was detected and stored by the Engine Control Module (ECM).

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Depending on the desired operating condition:switch on ignition

  or start engine and let run at idle.

- Under address word 33, select "Diagnostic mode 2: Check operating conditions."
- Select the desired operating condition "PID XX".

NOTE: The operating conditions are sorted by the PID (parameter-identifications).

DIAGNOSTIC MODE 2: CHECKING OPERATING CONDITIONS

PID	Display operating conditions
03:	Condition of the fuel system
04:	Calculated load condition value
05:	Coolant temperature
06:	Short time gasoline -air ratio bank 1
07:	Gasoline-air ratio bank 1
12:	Engine rotations per minute (RPM)
13:	Vehicle speed

- End diagnosis and switch ignition off.

Diagnostic mode 3: Check DTC Memory

Function

This diagnostic mode indicates all stored DTCs of components and systems which are emission relevant.

Malfunction Indicator Lamp (MIL) in instrument cluster lights up for a DTC entry.

SAE Diagnostic Trouble Codes (DTCs)

The DTC always consists of a 5-digit alphanumeric value with the following meaning:

Component group:

- Pxxxx = DTC for drivetrain.

  Norm-Code:

- P0xxx = DTCs defined by SAE with specified malfunction texts.
- P1xxx = additional emission relevant DTCs provided by manufacturer.

- P2xxx = DTCs defined by SAE with specified texts, from MY 2000
- P3xxx = additional emissions relevant DTCs provided by manufacturer from MY 2000.

  System group:

- Px0xx = Fuel -air mixture and additional emission regulations
- Px1xx = Fuel and air ratio.
- Px2xx = Fuel and air ratio.
- Px3xx = Ignition system.
- Px4xx = additional emission regulation.
- Px5xx = Speed and idle control.
- Px6xx = Control module and output signals.
- Px7xx = Transmission.
- Px8xx = Transmission.
- Px9xx = Control modules, input and output signals.

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.

NOTE: Only if engine does not start:

- **Operate starter for approx. 6 seconds. Do not switch ignition off afterward.**

- Under address word 33, select "Diagnostic mode 3:, Check DTC memory."

  The number of stored malfunctions or "0 malfunctions detected" is displayed.

- End diagnosis and switch ignition off.

- Repair stored malfunctions according to DTC table:
  - SAE P0xxx-DTCs, see **DIAGNOSTIC TROUBLE CODE (DTC) TABLES:** .
  - SAE P1xxx-DTCs, see **SAE P1XXX-DTCS** .
  - SAE P2xxx-DTCs, see **SAE P2XXX-DTCS** .
  - SAE P3xxx-DTCs, see **SAE P3XXX-DTCS** .
- Erase DTC memory, see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .

NOTE:

- **The DTC table is sorted by SAE codes.**

- *"E-Gas"-relevant malfunctions are also indicated by the warning lamp for Electronic Power Control ("EPC warning lamp") in the instrument cluster.*
- *"Emission"-relevant malfunctions are additionally indicated in the instrument cluster via the Malfunction Indicator Lamp (MIL).*
- In Diagnostic mode 2, it can be determined at which operating condition a malfunction was detected and stored by the Engine Control Module (ECM), see **DIAGNOSTIC MODE 2: CHECKING OPERATING CONDITIONS** .
- Erase DTC memory after repairing malfunction, see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .

Display example:

P0444Evaporative Emission System Purge Control Valve Circuit Open

Explanation:

- P0444 = SAE diagnostic trouble code (malfunction identification number).
- Evaporative Emission System Purge Control Valve = malfunctioning wiring path or malfunctioning component.
- Circuit Open = Malfunction type as text

Diagnostic mode 4: Reset/erase diagnostic data

Function

This diagnostic mode performs the following functions:

- all emission relevant malfunctions in DTC memory will be erased,
- the operating conditions at which a malfunction was stored will be reset, see **DIAGNOSTIC MODE 2: CHECKING OPERATING CONDITIONS** .
- all adaptation values are being reset,
- all test results of the diagnostic functions are being reset.

Requirement

- DTC memory was checked, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 4: Reset/erase diagnostic data."

Erased or reset:

- Number and content of the DTC memories,
- Operating conditions,
- Adaptation values,
- Test results.

- End diagnosis and switch ignition off.
- Generate readiness code, see **READINESS CODE, GENERATING** .

Diagnostic mode 5: Check output of oxygen sensor signals

Function

The static values of the oxygen sensors are indicated via this diagnostic mode.

The values of the individual oxygen sensor signal outputs must reach the specified value or must be within the min.- and max.- limits.

Requirements

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be at least 80 °C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 5: Check output of oxygen sensor signals".
- Select the desired output of oxygen sensor signals "Test -ID XX".

Evaluation of output of oxygen sensor signals:

- Test-ID 01 Bank 1 Sensor 2, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**
- Test-ID 02 Bank 1 Sensor 2, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**
- Test-ID 07 Bank 1 Sensor 2, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**
- Test-ID 08 Bank 1 Sensor 2, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**
- Test-ID 129 Bank 1 Sensor 1, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**
- Test-ID 130 Bank 1 Sensor 1, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**
- Test-ID 131 Bank 1 Sensor 1, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**
- Test-ID 132 Bank 1 Sensor 1, see **DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS THAT ARE NOT CONTINUOUSLY MONITORED**

- End diagnosis and switch ignition off.

Evaluation test-ID 01 Bank 1 Sensor 2: rich to lean sensor barrier voltage

EVALUATION TEST-ID 01 BANK 1 SENSOR 2: VOLTAGE SPECIFICATION

Specified value:	
min.	max.
Fixed value: 0.652 V	

If specified value is not obtained:

- Replace Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- Bank 1, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** , item 10.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Evaluation test-ID 02 Bank 1 Sensor 2: lean to rich sensor barrier voltage

EVALUATION TEST-ID 02 BANK 1 SENSOR 2: VOLTAGE SPECIFICATION

Specified value:	
min.	**max.**
Fixed value: 0.652 V	

If specified value is not obtained:

- Replace Oxygen Sensor (O2S) Behind Three Way Catalytic Converter (TWC) -G130- Bank 1, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** , item 10.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Evaluation test-ID 07 Bank 1 Sensor 2: Minimum voltage at sensor for test cycle

EVALUATION TEST-ID 07 BANK 1 SENSOR 2: VOLTAGE SPECIFICATION

Specified value:	
min.	**max.**
0.000	V 0.400 V

If the specified value is not reached:

- Short circuit to Ground (GND) in oxygen sensor or in wire:
- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

If the specified value is exceeded:

- Oxygen sensor not ready for operation
- Oxygen sensor heater faulty:
  - Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSORS BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
- Short circuit to B+ or open circuit in wiring in oxygen sensor or in wire:
- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

Evaluation test-ID 08 Bank 1 Sensor 2: Maximum voltage at sensor for test cycle

EVALUATION TEST-ID 08 BANK 1 SENSOR 2: VOLTAGE SPECIFICATION

Specified value:	
min.	**max.**
0.500	V 1.053 V

If the specified value is not reached:

- Oxygen sensor not ready for operation

- Oxygen sensor heater faulty:
- Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSORS BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** .
- Short circuit to Ground (GND) or open circuit in wiring in oxygen sensor or in wire:
- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

If the specified value is exceeded:

- Short circuit to B+ in oxygen sensor or in wire:
- Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** .

Evaluation test-ID 129 Bank 1 Sensor 1: Actual value of oxygen sensor voltage

EVALUATION TEST-ID 129 BANK 1 SENSOR 1: OXYGEN SENSOR VOLTAGE SPECIFICATION

Specified value:	
min.	**max.**
0.700	1.992

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) -G39- Bank 1 before catalytic converter, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** , item 8.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Evaluation test-ID 130 Bank 1 Sensor 1: Control barrier voltage

EVALUATION TEST-ID 130 BANK 1 SENSOR 1: CONTROL BARRIER VOLTAGE SPECIFICATION

Specified value:	
min.	**max.**
0.700	1.992

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) -G39- Bank 1 before catalytic converter, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** , item 8.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Evaluation test-ID 131 Bank 1 Sensor 1: Dynamic value

EVALUATION TEST-ID 131 BANK 1 SENSOR 1: DYNAMIC VALUE SPECIFICATION

Specified value:	
min.	**max.**
0.00	4.0

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) -G39- Bank 1 before catalytic converter, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** , item 8.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Evaluation test-ID 132 Bank 1 Sensor 1: Oxygen sensor shift via oxygen sensor control behind Three Way Catalytic Converter (TWC) (bank 1 sensor 2)

EVALUATION TEST-ID 132 BANK 1 SENSOR 1: OXYGEN SENSOR SPECIFIED VALUE

Specified value:	
min.	**max.**
-0.05	0.05

If specified values are not obtained:

- Replace Heated Oxygen Sensor (HO2S) -G39- Bank 1 before catalytic converter, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** , item 8.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Diagnostic mode 6: Check test results of components that are not continuously monitored

Function

This diagnostic mode displays the test results of emission relevant components and systems which are not continuously monitored.

The values of the individual test results must reach the specified value or must be within the min.- and max. -limits.

DIAGNOSTIC MODE 6: CHECK TEST RESULTS OF COMPONENTS

Test-ID	Component, System	Test
01:	Catalytic converter	See **TEST REQUIREMENTS**
03:	Secondary Air Injection (AIR) system	See **TEST REQUIREMENTS**
05:	Tank ventilation system	See **TEST REQUIREMENTS**
09:	Engine Coolant Temperature (ECT) Sensor -G62-	See **TEST REQUIREMENT**

Test-ID 01: Catalytic converter

Test requirements

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be at least 80 °C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Work procedure

- Read readiness code, see **READ READINESS CODE** .
- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test -ID 01: Catalytic converter".
- Check specified values at idle.

Evaluation test-ID 01:

EVALUATION TEST-ID 01: SPECIFIED VALUE SPECIFICATION

	Vehicles with engine code APH		Vehicles with engine code AWP, AWV	
	Specified value:		Specified value:	
Catalytic converter	min.	max.	min.	max.
• Catalytic converter monitoring bank 1, aging value	0.0977	0.3320	0.1992	0.2500
• Catalytic converter monitoring bank 1, aging value, short test	-	0.3789	-	0.3516

- End diagnosis and switch ignition off.

If the specified values are exceeded:

- Replace the front exhaust pipe with catalytic converter, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** , item 4.
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Test-ID 03: Secondary Air Injection (AIR) system

Test requirements

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Read readiness code, see **READ READINESS CODE** .
- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test -ID 03: Secondary Air Injection (AIR) system"
- Check specified values at idle.

Evaluation test-ID 03:

EVALUATION TEST-ID 03: SPECIFIED VALUE SPECIFICATION

Secondary Air Injection (AIR) system	Vehicles with engine code APH		Vehicles with engine code AWP, AWW	
	Specified value:		Specified value:	
	min.	max.	min.	max.
• reduced secondary air mass bank 1	0.5	-	0.4530	-
• very small secondary air mass bank 1, short test	0.102	-	0.3984	-
• Leakage bank 1, short test	-	14.0 kg/h	-	2.0 kg/h

- End diagnosis and switch ignition off.

  If the specified values are not reached:

- Check secondary air system for proper seal, see **CHECKING SECONDARY AIR SYSTEM FOR PROPER SEAL** .
- Check combination valve, see **COMBINATION VALVE, CHECKING** .
- Check Secondary Air Injection (AIR) Pump Motor -V101-, see **SECONDARY AIR INJECTION**

(AIR) PUMP MOTOR, CHECKING .

- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Test-ID 05: Tank ventilation system

Test requirements

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be 80 to 110 °C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Work procedure

- Read readiness code, see **READ READINESS CODE** .
- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test -ID 05: Tank ventilation system".
- Check specified values at idle.

Evaluation test-ID 05:

EVALUATION TEST-ID 05: SPECIFIED VALUE SPECIFICATION

Tank ventilation system	Specified value:	
Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-	**min.**	**max.**
• Passive test (can only check OK)	0.1484	-
• Active test: Deviation of oxygen sensor control in direction "lean" (can only check OK), short test	0.070	-
• Active test: Deviation of oxygen sensor control in direction "rich" (can only check OK), short test	-0.070	-
• Active test: Air balance at idle OK, also short test	30%	-
• Active test: Air balance at idle not OK, also short test	30%	-

EVALUATION TEST-ID 05: SPECIFIED VALUE SPECIFICATION

Tank ventilation system	Vehicles with engine code APH		Vehicles with engine code AWP, AWW	
	Specified value:		Specified value:	
Tank seal	**min.**	**max.**	**min.**	**max.**

• Large/small leak	1.6..1.90	-	1.65...1.90	-
• Reed contact not closed	-	0.5/s	-	0.5/s
• Reed contact does not open	-	25	-	30
• Tank ventilation system not OK during initial flush	30	-	0	-

If the specified values are exceeded:

- EVAP canister system, checking for proper seal, see **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL** .
- Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .
- Leak detection pump (LDP) -V144-, checking, see **CHECK LEAK DETECTION PUMP (LDP)** .
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Test-ID 09: Engine Coolant Temperature (ECT) Sensor -G62-

Test requirement

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Perform a road test until a coolant temperature of 80 to 100 °C has been reached, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Observe the safety precautions that apply to road tests, see **SAFETY PRECAUTIONS** .

- Switch ignition off.
- Start engine at a coolant temperature of 80 to 90 °C and let it run at idle.
- Perform a 5 minute road test in the highest gear or in the highest driving mode on a level driving surface.
- The following operating conditions must be met during this road test:

- Engine speed approx. 1800 to 2200 RPM, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 12, engine rotations per minute (RPM)
- Vehicle speed constant 90 km/h, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 13, Vehicle speed

Observe the safety precautions that apply to road tests, see **SAFETY PRECAUTIONS** .

- Let engine run at idle.
- Under address word 33, select "Diagnostic mode 6: Check test results of components that are not continuously monitored".
- Select the "Test -ID 09: Engine Coolant Temperature (ECT) sensor".
- Check specified values at idle.

Evaluation test-ID 09:

EVALUATION TEST-ID 09: SPECIFIED VALUE SPECIFICATION

	Specified value:	
Engine Coolant Temperature (ECT) Sensor -G62-	**min.**	**max.**
• Coolant temperature	80.3 °C	115 °C

If specified value is not obtained:

- Check Engine Coolant Temperature (ECT) Sensor -G62-, see **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING**
- Check coolant regulator:

  See **COOLING SYSTEM COMPONENTS (ENGINE SIDE)**

- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Diagnostic mode 7: Check test results of components that are continuously monitored

Function

This diagnostic mode indicates all stored DTCs of components and systems which are continuously monitored.

Requirement

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.

NOTE: Only if engine does not start:

- **Operate starter for approx. 6 seconds. Do not switch ignition off afterward.**

- Under address word 33, select "Diagnostic mode 7: Check test results of components that are continuously monitored".

The number of stored malfunctions or "0 malfunctions detected" is displayed.

- End diagnosis and switch ignition off.
- Repair stored malfunctions according to DTC table:

- SAE P0xxx-DTCs, see **DIAGNOSTIC TROUBLE CODE (DTC) TABLES:** .
- SAE P1xxx-DTCs, see **SAE P1XXX-DTCS** .
- SAE P2xxx-DTCs, see **SAE P2XXX-DTCS** .
- SAE P3xxx-DTCs, see **SAE P3XXX-DTCS** .

NOTE:

- **The DTC table is sorted by SAE codes.**
- **"E-Gas"-relevant malfunctions are also indicated by the warning lamp for Electronic Power Control ("EPC warning lamp") in the instrument cluster.**
- **Erase DTC memory after repairing malfunction, see DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA .**

Diagnostic mode 8: Tank leak test

Function

This diagnostic mode checks the fuel system for leaks.

NOTE:

- **The Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80- and Leak detection pump (LDP) -V144- seal the tank system.**
- **Pressure (max. 70 mbar) can be applied to the fuel system via the test connection (in engine compartment, right) and via engine leak detection spray (e.g.: G 001 800 A1) leaks can be detected.**

Test requirements

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be 80 to 110 °C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.
- Intake air temperature must not be above the maximum of 60 C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 15, Intake air temperature.

Function test

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .

- Start engine and let run at idle for at least 15 minutes.
- Under address word 33, select "Diagnostic mode 8: Tank leak test".
- Select measuring value "Test -ID 01: Tank leak test".
- Check specified value of tank leak test at idle.

TEST-ID 01: TANK LEAK TEST: SPECIFIED VALUE SPECIFICATION

Test-ID 01: Tank leak test	Specified value:
• Test function is being initiated, please wait • Test function aborted • Test function active • Test function off	Test function active

NOTE:

- **During tank leak test, Engine Control Module (ECM) limits "test function active" to approx. 12 minutes.**
- **If the accelerator pedal is depressed during the test, the test will be aborted.**
- **To repeat the tank leak test, switch ignition off and start engine again and let run at idle for at least 15 minutes.**

If specified value is obtained:

- End diagnosis and switch ignition off.

If specified value is not obtained:

- EVAP canister system, checking for proper seal, see **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL** .
- Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** .
- Leak detection pump (LDP) -V144-, checking, see **CHECK LEAK DETECTION PUMP (LDP)** .

Diagnostic mode 9: Vehicle information

Function

In this diagnostic mode, vehicle specific diagnostic data such as e.g. the control module versions will be displayed.

Requirement

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Switch ignition on.
- Under address word 33, select "Diagnostic mode 9: vehicle information".
- Select desired vehicle information "Test -ID XX".

Display vehicle information

DISPLAY VEHICLE INFORMATION

Test-ID	Diagnostic text
04:	Calibration identification example: • 06A906032LS 4745Engine Control Module (ECM) identification
06:	CVN (control module -check sum) example: • 7608.0034the check sum is different for every control module version • No results

- End diagnosis and switch ignition off.

READINESS CODE

Function

The readiness code is an 8 digit number block that indicates the status of emission relevant diagnostics.

When the diagnostic for a system (e.g.: secondary air system) has run through successfully, the respective digit of the number block is set from 1 to 0.

Diagnostics are performed at regular intervals during normal vehicle operation. After repairing an exhaust relevant system, the readiness code should be generated via a road test to ensure that these systems are working according to specifications. If a malfunction is recognized during diagnostic, it is stored in DTC memory.

The readiness code is erased every time DTC memory is erased or when voltage supply is interrupted. DTC memory should therefore only be erased when there are DTCs stored.

Read readiness code

Requirements

- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Coolant temperature must be at least 80 °C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Start engine and let run at idle.
- Under address word 33, select "Diagnostic mode 1: Checking measured values."
- select desired measuring value "PID 01".
- Observe the right 8 -digit number block:

If all diagnoses have run through successfully, the 8-digit number block

Specified value: 00000000 must be displayed.

Evaluation PID 01: System status-information (right 8-digit number block:)

EVALUATION PID 01: SYSTEM STATUS-INFORMATION

Meaning if display position = 0								
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Diagnostic function**
0								Exhaust gas recirculation OK • not available/always "0"
	0							Oxygen sensor heater OK
		0						Oxygen sensors OK
			0					A/C system OK • no diagnostic/always "0"
				0				Secondary Air Injection (AIR) system OK
					0			EVAP canister system (tank ventilation system) OK
						0		Catalytic converter heater OK • no diagnostic/always "0"
							0	Catalytic converter OK

If a 1 is displayed instead of a 0 in the 8 -digit number block:

- Generate readiness code, see **READINESS CODE, GENERATING** .

Readiness code, generating

Requirements

- The respective fuses of the Motronic fuel injection and ignition system must be OK. Fuse holder is located behind access panel at far left end of dash.

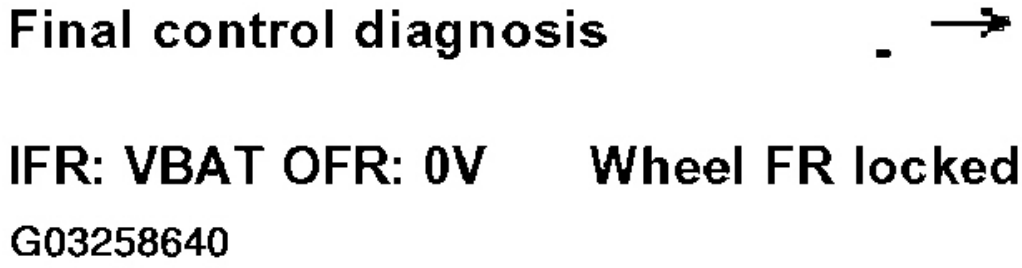

Fig. 12: Identifying Fuses
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Battery voltage must be at least 11.5 volts.
- All electrical consumers such as, for example, lights and rear window defroster must be switched off.
- If vehicle is equipped with an A/C system, it must be switched off.
- Ground (GND) connections between engine and chassis must be OK.
- There must not be any DTCs stored in DTC memory, see **DIAGNOSTIC MODE 3: CHECK DTC MEMORY** .
- Intake air temperature 5 to 35 C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 15: Intake Air Temperature (IAT)

Work procedure

- Connect diagnostic tester, see **CONNECT DIAGNOSTIC TESTER** .
- Perform a road test.

The following operating condition must be met during this road test:

- Coolant temperature must reach at least 80 C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Observe the safety precautions that apply to road tests, see **SAFETY PRECAUTIONS** .

Let vehicle cool off with the ignition switched off until the following condition is met:

- Coolant temperature approx. intake air temperature (5 to 35 °C), see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

- Perform a road test anew.

The following operating conditions must be met during this road test:

- Accelerate vehicle uniformly, not at Wide Open Throttle (WOT).
- Drive for 10 minutes in the highest gear or in the highest driving mode on a level driving surface at a constant speed in the range of 65 to 80 km/h at an engine speed of 2000 to 2500 RPM.

NOTE:

- **Vehicle speed, see DIAGNOSTIC MODE 1: CHECK MEASURED VALUES ; PID 13, Vehicle speed.**
- **Engine speed, see DIAGNOSTIC MODE 1: CHECK MEASURED VALUES ; PID 12, engine rotations per minute (RPM).**

- After 10 minutes, downshift until an engine speed of 2800 to 3500 RPM has been reached.
- Drive in deceleration mode at a speed up to approx. 1800 RPM.
- Park vehicle and let engine run at idle for 3 minutes.
  - Accelerator pedal must not be operated during this time.
- Perform a road test anew.

The following operating conditions must be met during this road test:

- Accelerate vehicle uniformly, not at Wide Open Throttle (WOT).
- Drive for 10 minutes in the highest gear or in the highest driving mode on a level driving surface at a constant speed in the range of 65 to 80 km/h at an engine speed of 2000 to 2500 RPM.
- Park vehicle and let engine run at idle for 3 minutes.
  - Accelerator pedal must not be operated during this time.
- Read readiness code, see **READ READINESS CODE** .

If a 1 is displayed instead of a 0 in the 8-digit number block:

- Perform a road test anew.

The following operating conditions must be met during this road test:

- Drive for 10 minutes in the highest gear or in the highest driving mode on a level driving surface at a constant speed in the range of 65 to 80 km/h at an engine speed of 2000 to 2500 RPM.
- Park vehicle and let run at idle for 3 minutes.
  - Accelerator pedal must not be operated during this time.
- Read readiness code, see **READ READINESS CODE** .

In 8-digit number block:

- Display position 5: Secondary Air Injection (AIR) system

  and/or

- Display position 6: EVAP canister system

a 1 instead of 0 is displayed:

- Repeat complete work procedure, see **WORK PROCEDURE**

DIAGNOSTIC TROUBLE CODE (DTC) TABLES:

SAE P0xxx-DTCs

Fuel and air mixture and additional emission regulations

DIAGNOSTIC TROUBLE CODE P0010 TO P0032

SAE DTC	DTC text	Corrective action
P0010	"A" Camshaft Position Actuator Circuit Bank 1	• Check Valve -1- for camshaft adjustment -N205-, see **VALVE FOR CAMSHAFT ADJUSTMENT, CHECKING (VEHICLES WITH ENGINE CODE AWP, AWV)**
P0011	"A" Camshaft Position - Timing Over - Advanced or System Performance Bank 1	
P0012	"A" Camshaft Position - Timing Over - Retarded Bank 1	
P0016	Crankshaft Position - Camshaft Position Correlation Bank 1 Sensor A	• Check Camshaft Position (CMP) Sensor -G40-or Camshaft Position (CMP) Sensor 2 -G163-, see **CHECK CAMSHAFT POSITION (CMP) SENSOR**
P0030	HO2S Heater Control Circuit Bank 1 Sensor 1	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** • Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER**
P0031	HO2S Heater Control Circuit Low Bank 1 Sensor 1	
P0032	HO2S Heater Control Circuit High Bank 1 Sensor 1	

DIAGNOSTIC TROUBLE CODE P0036 TO P0038

SAE DTC	DTC text	Corrective action

P0036	HO2S Heater Control Circuit Bank 1 Sensor 2	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSORS BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER**
P0037	HO2S Heater Control Circuit Low Bank 1 Sensor 2	
P0038	HO2S Heater Control Circuit High Bank 1 Sensor 2	

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P0101 TO P0113

SAE DTC	DTC text	Corrective action
P0101	Mass or Volume Air Flow Circuit Range/Performance	• Check Mass Air Flow (MAF) Sensor -G70-, see **MASS AIR FLOW (MAF) SENSOR, CHECKING** • Check intake air system for leaks (false air), see **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING**
P0102	Mass or Volume Air Flow Circuit Low Input	
P0103	Mass or Volume Air Flow Circuit High Input	
P0112	Intake Air Temperature Sensor 1 Circuit Low	• Check Intake Air Temperature (IAT) Sensor -G42-, see **CHECKING INTAKE AIR TEMPERATURE (IAT) SENSOR**
P0113	Intake Air Temperature Sensor 1 Circuit High	

[1)] Intake manifold pressure is determined by the Charge Air Pressure Sensor -G31- (instead of Manifold Absolute Pressure (MAP) Sensor -G71- as indicated), air pressure is determined by the Barometric Pressure (BARO) Sensor - F96- (in ECM).

DIAGNOSTIC TROUBLE CODE P0116 TO P0135

SAE DTC	DTC text	Corrective action
P0116	Engine Coolant Temperature Circuit Range/Performance	• Check Engine Coolant Temperature (ECT) Sensor -G62-, see **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** • Check coolant regulator: See **COOLING SYSTEM COMPONENTS (ENGINE SIDE)**
P0117	Engine Coolant Temperature Circuit Low	
P0118	Engine Coolant Temperature Circuit High	
P0121	Throttle/Pedal Position Sensor/Switch "A" Circuit	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE,**

	Range/Performance	**CHECKING**
P0122	Throttle/Pedal Position Sensor/Switch "A" Circuit Low	
P0123	Throttle/Pedal Position Sensor/Switch "A" Circuit High	
P0132	O2 Sensor Circuit High Voltage Bank 1 Sensor 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER**
P0133	O2 Sensor Circuit Slow Response Bank 1 Sensor 1	
P0134	O2 Sensor Circuit No Activity Detected Bank 1 Sensor 1	
P0135	O2 Sensor Heater Circuit Bank 1 Sensor 1	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING**

DIAGNOSTIC TROUBLE CODE P0136 TO P0141

SAE DTC	DTC text	Corrective action
P0136	O2 Sensor Circuit Bank 1 Sensor 2	• Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER**
P0137	O2 Sensor Circuit Low Voltage Bank 1 Sensor 2	
P0138	O2 Sensor Circuit High Voltage Bank 1 Sensor 2	
P0139	O2 Sensor Circuit Slow Response Bank 1 Sensor 2	
P0140	O2 Sensor Circuit No Activity Detected Bank 1 Sensor 2	
P0141	O2 Sensor Heater Circuit Bank 1 Sensor 2	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSORS BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING**

DIAGNOSTIC TROUBLE CODE P0171

SAE DTC	DTC text	Corrective action
P0171	System Too Lean Bank 1	• Check fuel pressure regulator and residual pressure, see **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING** • Check intake air system for leaks (false air), see **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** • Check Fuel Pump (FP) -G6-, see **CHECK FUEL PUMP** • Check exhaust system for proper seal, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** • Check Secondary Air Injection (AIR) system for proper seal, see **CHECKING SECONDARY AIR SYSTEM FOR PROPER SEAL** • Check vacuum lines for leaks

DIAGNOSTIC TROUBLE CODE P0172

SAE DTC	DTC text	Corrective action
P0172	System Too Rich Bank 1	• Check fuel pressure regulator and residual pressure, see **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING** • Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER** • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING**

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P0201 TO P0204

SAE DTC	DTC text	Corrective action
P0201	Injector Circuit/Open - Cylinder 1	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING**
P0202	Injector Circuit/Open	

	- Cylinder 2	
P0203	Injector Circuit/Open - Cylinder 3	
P0204	Injector Circuit/Open - Cylinder 4	

DIAGNOSTIC TROUBLE CODE P0221 TO P0238

SAE DTC	DTC text	Corrective action
P0221	Throttle/Pedal Position Sensor/Switch "B" Circuit Range/Performance	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE, CHECKING**
P0222	Throttle/Pedal Position Sensor/Switch "B" Circuit Low	
P0223	Throttle/Pedal Position Sensor/Switch "B" Circuit High	
P0230	Fuel Pump Primary Circuit	• Check activation of Fuel Pump (FP) Relay -J17- according to wiring diagram.
P0236	Turbo/Super Charger Boost Sensor "A" Circuit Range/Performance	• Check Charge Air Pressure Sensor -G31-, see **CHARGE AIR PRESSURE SENSOR, CHECKING**
P0237	Turbo/Super Charger Boost Sensor "A" Circuit Low	
P0238	Turbo/Super Charger Boost Sensor "A" Circuit High	

DIAGNOSTIC TROUBLE CODE P0261 TO P0271

SAE DTC	DTC text	Corrective action
P0261	Cylinder 1 Injector Circuit Low	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector - N33-), see **FUEL INJECTORS, CHECKING**
P0262	Cylinder 1 Injector Circuit High	
P0264	Cylinder 2 Injector Circuit Low	
P0265	Cylinder 2 Injector Circuit High	
P0267	Cylinder 3 Injector Circuit Low	
P0268	Cylinder 3 Injector Circuit High	
P0270	Cylinder 4 Injector Circuit Low	
P0271	Cylinder 4 Injector Circuit High	

DIAGNOSTIC TROUBLE CODE P0300 TO P0304

SAE DTC	DTC text	Corrective action
P0300	Random/Multiple Cylinder Misfire Detected	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING** • Check spark plugs, see **TEST DATA, SPARK PLUGS** • Check ignition coils with power output stage, see **IGNITION COILS WITH POWER OUTPUT STAGES, CHECKING**
P0301	Cylinder 1 Misfire Detected	
P0302	Cylinder 2 Misfire Detected	
P0303	Cylinder 3 Misfire Detected	
P0304	Cylinder 4 Misfire Detected	

DIAGNOSTIC TROUBLE CODE P0321 TO P0333

SAE DTC	DTC text	Corrective action
P0321	Ignition/Distributor Engine Speed Input Circuit Range/Performance	• Check Engine Speed (RPM) Sensor -G28-, see **CHECK ENGINE SPEED (RPM) SENSOR**
P0322	Ignition/Distributor Engine Speed Input Circuit No Signal	
P0324	Knock Control System Error	• Check knock sensors (Knock Sensor (KS) 1 -G61- and Knock Sensor (KS) 2 -G66-), see **CHECK KNOCK SENSORS** • Loosen knock sensors and tighten to 20 Nm again • Repair abnormal engine noise (components loose, bracket/bolts broken) • Change fuel types
P0327	Knock Sensor 1 Circuit Low Bank 1 or Single Sensor	• Check knock sensors (Knock Sensor (KS) 1 -G61- and Knock Sensor (KS) 2 -G66-), see **CHECK KNOCK SENSORS** • Loosen knock sensors and tighten to 20 Nm again
P0328	Knock Sensor 1 Circuit High Bank 1 or Single Sensor	
P0332	Knock Sensor 2 Circuit Low Bank 2	
P0333	Knock Sensor 2 Circuit High Bank 2	

DIAGNOSTIC TROUBLE CODE P0341 TO P0354

SAE DTC	DTC text	Corrective action
P0341	Camshaft Position Sensor "A" Circuit Range/Performance Bank 1 or Single Sensor	• Check Camshaft Position (CMP) Sensor - G40-, see **CHECK CAMSHAFT POSITION (CMP) SENSOR**
P0342	Camshaft Position Sensor "A" Circuit Low Bank 1 or Single Sensor	
P0343	Camshaft Position Sensor "A" Circuit	

	High Bank 1 or Single Sensor	
P0351	Ignition Coil "A" Primary/Secondary Circuit	• Check ignition coils with power output stage, see **IGNITION COILS WITH POWER OUTPUT STAGES, CHECKING**
P0352	Ignition Coil "B" Primary/Secondary Circuit	
P0353	Ignition Coil "C" Primary/Secondary Circuit	
P0354	Ignition Coil "D" Primary/Secondary Circuit	

Additional exhaust regulation

DIAGNOSTIC TROUBLE CODE P0411 TO P0418

SAE DTC	DTC text	Corrective action
P0411	Secondary Air Injection System Incorrect Flow Detected	• Check Secondary Air Injection (AIR) Pump Motor -V101-, see **SECONDARY AIR INJECTION (AIR) PUMP MOTOR, CHECKING** • Check Secondary Air Injection (AIR) Solenoid Valve -N112-, see **SECONDARY AIR INJECTION (AIR) VALVE, CHECKING** • Check combination valve, see **COMBINATION VALVE, CHECKING** • Checking hoses and connecting pipes to and between components, see **SECONDARY AIR INJECTION (AIR) SYSTEM**
P0412	Secondary Air Injection System Switching Valve "A" Circuit	• Check Secondary Air Injection (AIR) Solenoid Valve -N112-, see **SECONDARY AIR INJECTION (AIR) VALVE, CHECKING**
P0413	Secondary Air Injection System Switching Valve "A" Circuit Open	
P0414	Secondary Air Injection System Switching Valve "A" Circuit Shorted	
P0418	Secondary Air Injection System Control "A" Circuit	• Check activation of Secondary Air Injection (AIR) Pump Relay -J299-.

DIAGNOSTIC TROUBLE CODE P0420 TO P0456

SAE DTC	DTC text	Corrective action
P0420	Catalyst System Efficiency Below Threshold Bank 1	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC), see **CHECK OXYGEN**

		SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER • Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER**
P0441	Evaporative Emission System Incorrect Purge Flow	• Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING** • EVAP canister system, check for proper seal, see **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL**
P0442	Evaporative Emission System Leak Detected (small leak)	
P0444	Evaporative Emission System Purge Control Valve Circuit Open	
P0445	Evaporative Emission System Purge Control Valve Circuit Shorted	
P0455	Evaporative Emission System Leak Detected (large leak)	
P0456	Evaporative Emission System Leak Detected (very small leak)	

Speed and idle control

DIAGNOSTIC TROUBLE CODE P0501 TO P0507

SAE DTC	DTC text	Corrective action
P0501	Vehicle Speed Sensor "A" Range/Performance	• Check speed signal, see **SPEED SIGNAL, CHECKING**
P0506	Idle Air Control System RPM Lower Than Expected	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE, CHECKING**
P0507	Idle Air Control System RPM Higher Than Expected	

Control module and output signals

DIAGNOSTIC TROUBLE CODE P0600 TO P0638

SAE DTC	DTC text	Corrective action
P0600	Serial Communication Link	• Check terminal resistance for CAN-Bus, see **TERMINAL RESISTANCE FOR CAN-BUS,**

		CHECKING
P0601	Internal Control Module Memory Check Sum Error	• Replace Motronic Engine Control Module (ECM) -J220-, see **REPLACING ENGINE CONTROL MODULE (ECM)**
P0602	Control Module Programming Error	
P0604	Internal Control Module Random Access Memory (RAM) Error	
P0605	Internal Control Module Read Only Memory (ROM) Error	
P0606	ECM/PCM Processor	
P0638	Throttle Actuator Control Range/Performance Bank 1	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE, CHECKING** • Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-, see **THROTTLE POSITION (TP) SENSOR, CHECKING**

DIAGNOSTIC TROUBLE CODE P0685 TO P0687

SAE DTC	DTC text	Corrective action
P0685	ECM/PCM Power Relay Control Circuit /Open	• Check voltage supply of Motronic Engine Control Module (ECM) -J220-, see **VOLTAGE SUPPLY FOR ENGINE CONTROL MODULE (ECM), CHECKING** • Check Activation of Motronic Engine Control Module (ECM) Power Supply Relay -J271- according to wiring diagram.
P0686	ECM/PCM Power Relay Control Circuit Low	
P0687	ECM/PCM Power Relay Control Circuit High	

SAE P1xxx-DTCs

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P1102 & P1105

SAE DTC	DTC text	Corrective action
P1102	"O2 Sensor Heating Circ.,Bank1 - Sensor1 Short to B+"	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING**
P1105	"O2 Sensor Heating Circ.,Bank1 - Sensor2 Short to B+"	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSORS BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING**

DIAGNOSTIC TROUBLE CODE P1115 TO P1127

SAE DTC	DTC text	Corrective action
P1115	"O2 Sensor Heater Circ.,Bank1 - Sensor1 Short to Ground"	• Check oxygen sensor heater for Oxygen Sensor (O2S) before Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING**
P1116	"O2 Sensor Heater Circ.,Bank1 - Sensor1 Open"	
P1117	"O2 Sensor Heater Circ.,Bank1 - Sensor2 Short to Ground"	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSORS BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING**
P1118	"O2 Sensor Heater Circ.,Bank1 - Sensor2 Open"	
P1127	"Long Term Fuel Trim mult.,Bank1 System too Rich"	• Check fuel pressure regulator and residual pressure, see **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING** • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING**

DIAGNOSTIC TROUBLE CODE P1128

SAE DTC	DTC text	Corrective action
P1128	"Long Term Fuel Trim mult.,Bank1 System too Lean"	• Check fuel pressure regulator and residual pressure, see **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING** • Check intake air system for leaks (false air), see **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** • Check Fuel Pump (FP) -G6 -, see **CHECK FUEL PUMP** • Check exhaust system for proper seal, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** • Check Secondary Air Injection (AIR) system for proper seal, see **CHECKING SECONDARY AIR SYSTEM FOR PROPER SEAL** • Check vacuum lines for leaks

DIAGNOSTIC TROUBLE CODE P1136 & P1137

SAE DTC	DTC text	Corrective action
P1136	"Long Term Fuel Trim Add. Fuel,Bank1 System too Lean"	• Check fuel pressure regulator and residual pressure, see **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** • Check intake air system for leaks (false air), see **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING** • Check Fuel Pump (FP) -G6-, see **CHECK FUEL PUMP** • Check exhaust system for proper seal, see **EXHAUST SYSTEM COMPONENTS, REMOVING AND INSTALLING** • Check Secondary Air Injection (AIR) system for proper seal, see **CHECKING SECONDARY AIR SYSTEM FOR PROPER SEAL** • Check vacuum lines for leaks
P1137	"Long Term Fuel Trim Add. Fuel,Bank1 System too Rich"	• Check fuel pressure regulator and residual pressure, see **FUEL PRESSURE REGULATOR AND RESIDUAL PRESSURE, CHECKING** • Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING** • Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING**

NOTE: add = additive, means that malfunction is only valid at closed throttle (idle).

DIAGNOSTIC TROUBLE CODE P1171 TO P1198

SAE DTC	DTC text	Corrective action
P1171	"Throttle Actuation Potentiometer Sign.2 Range/Performance"	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE, CHECKING**
P1172	"Throttle Actuation Potentiometer Sign.2 Signal too Low"	
P1173	"Throttle Actuation Potentiometer Sign.2 Signal too High"	
P1176	"O2 Correction Behind Catalyst,B1 Limit Attained"	• Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER**

		• Check Oxygen Sensor (O2S) and oxygen sensor control behind Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEHIND CATALYTIC CONVERTER** • Check intake air system for leaks (false air), see **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING**
P1198	"O2 Sensor Heater Circ.,Bank1 -Sensor2 Electrical Malfunction"	• Check oxygen sensor heater for Oxygen Sensor (O2S) behind Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSORS BEHIND THREE WAY CATALYTIC CONVERTER (TWC), CHECKING**

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P1213 TO P1216

SAE DTC	DTC text	Corrective action
P1213	"Cyl.1 -Fuel Inj. Circ. Short to B+"	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector - N33-), see **FUEL INJECTORS, CHECKING**
P1214	"Cyl.2 -Fuel Inj. Circ. Short to B+"	
P1215	"Cyl.3 -Fuel Inj. Circ. Short to B+"	
P1216	"Cyl.4 -Fuel Inj. Circ. Short to B+"	

DIAGNOSTIC TROUBLE CODE P1125 TO P1296

SAE DTC	DTC text	Corrective action
P1225	"Cyl.1 -Fuel Inj. Circ. Short to Ground"	• Check fuel injectors (Cylinder 1 Fuel Injector -N30- to Cylinder 4 Fuel Injector -N33-), see **FUEL INJECTORS, CHECKING**
P1226	"Cyl.2 -Fuel Inj. Circ. Short to Ground"	
P1227	"Cyl.3 -Fuel Inj. Circ. Short to Ground"	
P1228	"Cyl.4 -Fuel Inj. Circ. Short to Ground"	
P1237	"Cyl.1 -Fuel Inj. Circ. Open Circ."	
P1238	"Cyl.2 -Fuel Inj. Circ. Open Circ."	
P1239	"Cyl.3 -Fuel Inj. Circ. Open Circ."	
P1240	"Cyl.4 -Fuel Inj. Circ.	

	Open Circ."	
P1296	"Cooling System Malfunction"	• Check Engine Coolant Temperature (ECT) Sensor -G62-, see **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** • Check coolant regulator: See **COOLING SYSTEM COMPONENTS (ENGINE SIDE)**

Ignition system

DIAGNOSTIC TROUBLE CODE P1336

SAE DTC	DTC text	Corrective action
P1336	"Engine torque control Adaption at limit"	• Check Engine Coolant Temperature (ECT) Sensor -G62-, see **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** • Check Intake Air Temperature (IAT) Sensor -G42-, see **CHECKING INTAKE AIR TEMPERATURE (IAT) SENSOR**

DIAGNOSTIC TROUBLE CODE P1340 TO P1366

SAE DTC	DTC text	Corrective action
P1340	"Crankshaft-/Camshaft Pos. Sens. Signals Out of Sequence"	• Check Camshaft Position (CMP) Sensor -G40-or Camshaft Position (CMP) Sensor 2 -G163-, see **CHECK CAMSHAFT POSITION (CMP) SENSOR** • Check Engine Speed (RPM) Sensor -G28-, see **CHECK ENGINE SPEED (RPM) SENSOR**
P1355	"Cyl. 1, ignition circuit open"	• Check ignition coils with power output stage, see **IGNITION COILS WITH POWER OUTPUT STAGES, CHECKING**
P1356	"Cyl. 1, ignition circuit short to B+"	
P1357	"Cyl. 1, ignition circuit short to ground"	
P1358	"Cyl. 2, ignition circuit open"	
P1359	"Cyl. 2, ignition circuit short to B+"	
P1360	"Cyl. 2, ignition circuit short to ground"	
P1361	"Cyl. 3, ignition circuit open"	
P1362	"Cyl. 3, ignition circuit short to B+"	

P1363	"Cyl. 3, ignition circuit short to ground"	
P1364	"Cyl. 4 ignition circuit open"	
P1365	"Cyl. 4, ignition circuit short to B+"	
P1366	"Cyl. 4, ignition circuit short to ground"	

DIAGNOSTIC TROUBLE CODE P1387 & P1388

SAE DTC	DTC text	Corrective action
P1387	"Internal Contr. Module altitude sensor error"	• Replace Motronic Engine Control Module (ECM) -J220-, see **REPLACING ENGINE CONTROL MODULE (ECM)**
P1388	"Internal Contr. Module drive by wire error"	

Additional exhaust regulation

DIAGNOSTIC TROUBLE CODE P1409 TO P1426

SAE DTC	DTC text	Corrective action
P1409	"Tank Ventilation Valve Circ Electrical Malfunction"	• Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING**
P1410	"Tank Ventilation Valve Circ Short to B+"	
P1420	"Sec. Air Inj. Valve Circ Electrical Malfunction"	• Check Secondary Air Injection (AIR) Solenoid Valve -N112-, see **SECONDARY AIR INJECTION (AIR) VALVE, CHECKING**
P1421	"Sec. Air Inj. Valve Circ Short to Ground"	
P1422	"Sec. Air Inj. Sys. Contr. Valve Circ Short to B+"	
P1424	"Sec. Air Inj. Sys., Bank1 Leak Detected"	• Check Secondary Air Injection (AIR) system for proper seal, see **CHECKING SECONDARY AIR SYSTEM FOR PROPER SEAL**
P1425	"Tank Vent. Valve Short to Ground"	• Check Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING**
P1426	"Tank Vent. Valve Open"	

DIAGNOSTIC TROUBLE CODE P1432 TO P1435

SAE DTC	DTC text	Corrective action
P1432	"Sec. Air Inj. Valve Open"	• Check Secondary Air Injection (AIR) Solenoid Valve -N112-, see **SECONDARY AIR INJECTION (AIR) VALVE, CHECKING**
P1433	"Sec. Air Inj. Sys. Pump Relay Circ open"	• Check activation of Secondary Air Injection (AIR) Pump Relay -J299-.
P1434	"Sec. Air Inj. Sys. Pump Relay Circ Short to B+"	
P1435	"Sec. Air Inj. Sys. Pump Relay Circ Short to ground"	

DIAGNOSTIC TROUBLE CODE P1471 TO P1476

SAE DTC	DTC text	Corrective action
P1471	"EVAP Emission Contr. LDP Circ. Short to B+"	• Check Leak detection pump (LDP) -V144-, see **CHECK LEAK DETECTION PUMP (LDP)** • Check EVAP canister system, see **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL**
P1472	"EVAP Emission Contr. LDP Circ. Short to Ground"	
P1473	"EVAP Emission Contr. LDP Circ. Open Circ."	
P1475	"EVAP Emission Contr. LDP Circ. Malfunction/Signal Circ.Open"	
P1476	"EVAP Emission Contr. LDP Circ. Malfunction/Insufficient Vacuum"	

Speed and idle control

DIAGNOSTIC TROUBLE CODE P1501 & P1502

SAE DTC	DTC text	Corrective action
P1501	"Fuel Pump Relais Circ. Short to Ground"	• Check activation of Fuel Pump (FP) Relay -J17- according to wiring diagram.
P1502	"Fuel Pump Relais Circ. Short to B+"	

DIAGNOSTIC TROUBLE CODE P1541 TO P1545

SAE DTC	DTC text	Corrective action
P1541	"Fuel Pump Relay Circ. Open"	• Check activation of Fuel Pump (FP) Relay -J17- according to wiring diagram.
P1542	"Throttle Actuation Potentiometer	• Check Throttle Valve Control Module -J338-, see

	Range/Performance"	**THROTTLE VALVE CONTROL MODULE, CHECKING**
P1543	"Throttle Actuation Potentiometer Signal too Low"	
P1544	"Throttle Actuation Potentiometer Signal too High"	
P1545	"Throttle Pos. Contr. Malfunction"	

DIAGNOSTIC TROUBLE CODE P1558 TO P1565

SAE DTC	DTC text	Corrective action
P1558	"Throttle Actuator Electrical Malfunction"	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE, CHECKING**
P1559	"Idle Speed Contr. Throttle Pos. Adaptation Malfunction"	
P1560	"Maximum Engine Speed Exceeded"	• Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** • Repair mechanical damage
P1565	"Idle Speed Control Throttle Position lower limit not attained"	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE, CHECKING**

DIAGNOSTIC TROUBLE CODE P1592

SAE DTC	DTC text	Corrective action
P1592	"Barometric/boost pressure signal ratio out of range"	• Check Charge Air Pressure Sensor -G31-, see **CHARGE AIR PRESSURE SENSOR, CHECKING**

Control module and output signals

DIAGNOSTIC TROUBLE CODE P1603 TO P1673

SAE DTC	DTC text	Corrective action
P1603	"Internal Control Module Self Check"	• Replace Motronic Engine Control Module (ECM) -J220-, see **REPLACING ENGINE CONTROL MODULE (ECM)**
P1630	"Accelera. Pedal Pos. Sensor 1 Signal too Low"	• Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-, see **THROTTLE POSITION (TP) SENSOR, CHECKING**
P1631	"Accelera. Pedal Pos. Sensor 1 Signal too High"	
P1633	"Accelera. Pedal Pos. Sensor 2 Signal too Low"	

P1634	"Accelera. Pedal Pos. Sensor 2 Signal too High"	
P1639	"Accelera. Pedal Pos. Sensor 1+2 Range/Performance"	
P1640	"Internal Contr. Module (EEPROM) Error"	• Replace Motronic Engine Control Module (ECM) -J220-, see **REPLACING ENGINE CONTROL MODULE (ECM)**
P1648	"Data Bus Powertrain defect"	• Check terminal resistance for CAN-Bus, see **TERMINAL RESISTANCE FOR CAN-BUS, CHECKING**
P1649	"Data Bus Powertrain missing message from break ECU"	• Check DTC memory of ABS control module: See **ON BOARD DIAGNOSTIC (OBD)**
P1673	Speed Signal error message from ABS ECU	

SAE P2xxx-DTCs

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P2101 TO P2138

SAE DTC	DTC text	Corrective action
P2101	Throttle Actuator Control Motor Circuit Range/Performance	• Check Throttle Valve Control Module -J338-, see **THROTTLE VALVE CONTROL MODULE, CHECKING**
P2106	Throttle Actuator Control System - Forced Limited Power	
P2122	Throttle/Pedal Position Sensor/Switch "D" Circuit Low Input	• Check Throttle Position (TP) Sensor -G79- and Sender -2- for accelerator pedal position -G185-, see **THROTTLE POSITION (TP) SENSOR, CHECKING**
P2123	Throttle/Pedal Position Sensor/Switch "D" Circuit High Input	
P2127	Throttle/Pedal Position Sensor/Switch "E" Circuit Low Input	
P2128	Throttle/Pedal Position Sensor/Switch "E" Circuit High Input	
P2133	Throttle/Pedal Position Sensor/Switch "F" Circuit High Input	
P2138	Throttle/Pedal Position Sensor/Switch "D" / "E" Voltage Correlation	

DIAGNOSTIC TROUBLE CODE P2181 & P2279

SAE DTC	DTC text	Corrective action
P2181	Cooling System Performance	• Check Engine Coolant Temperature (ECT) Sensor -G62-, see **ENGINE COOLANT TEMPERATURE (ECT) SENSOR, CHECKING** • Check coolant regulator: See **COOLING SYSTEM COMPONENTS (ENGINE SIDE)**
P2279	Intake Air System Leak	• Check intake air system for leaks (false air), see **INTAKE SYSTEM FOR LEAKS (FALSE AIR), CHECKING**

Additional exhaust regulation

DIAGNOSTIC TROUBLE CODE P2400 TO P2404

SAE DTC	DTC text	Corrective action
P2400	Evaporative Emission System Leak Detection Pump Control Circuit/Open	• Check Leak detection pump (LDP) -V144-, see **CHECK LEAK DETECTION PUMP (LDP)** • EVAP canister system, check for proper seal, see **EVAP CANISTER SYSTEM, CHECKING FOR PROPER SEAL**
P2401	Evaporative Emission System Leak Detection Pump Control Circuit Low	
P2402	Evaporative Emission System Leak Detection Pump Control Circuit High	
P2403	Evaporative Emission System Leak Detection Pump Sense Circuit/Open	
P2404	Evaporative Emission System Leak Detection Pump Sense Circuit Range/Performance	

SAE P3xxx-DTCs

Fuel and air mixture and additional emission regulations

DIAGNOSTIC TROUBLE CODE P3081

SAE DTC	DTC text	Corrective action
P3081	Engine temperature to low	• Let engine warm up • Coolant temperature must be at least 50 C Diagnostic mode 1: Check measuring values; PID 5, Coolant temperature

Fuel and air ratios

DIAGNOSTIC TROUBLE CODE P3211

SAE		

DTC	DTC text	Corrective action
P3211	Exhaust-bank1-sensor1, Heater return connection	• Check oxygen sensor heater for oxygen sensors before Three Way Catalytic Converter (TWC), see **OXYGEN SENSOR HEATER FOR OXYGEN SENSOR BEFORE THREE WAY CATALYTIC CONVERTER (TWC), CHECKING** • Check Oxygen Sensor (O2S) and oxygen sensor control before Three Way Catalytic Converter (TWC), see **CHECK OXYGEN SENSOR AND OXYGEN SENSOR REGULATION BEFORE CATALYTIC CONVERTER**